

APOLLO SOYUZ TEST PROJECT

USA - USSR

FACT SHEET

RELEASE NO: 75-9

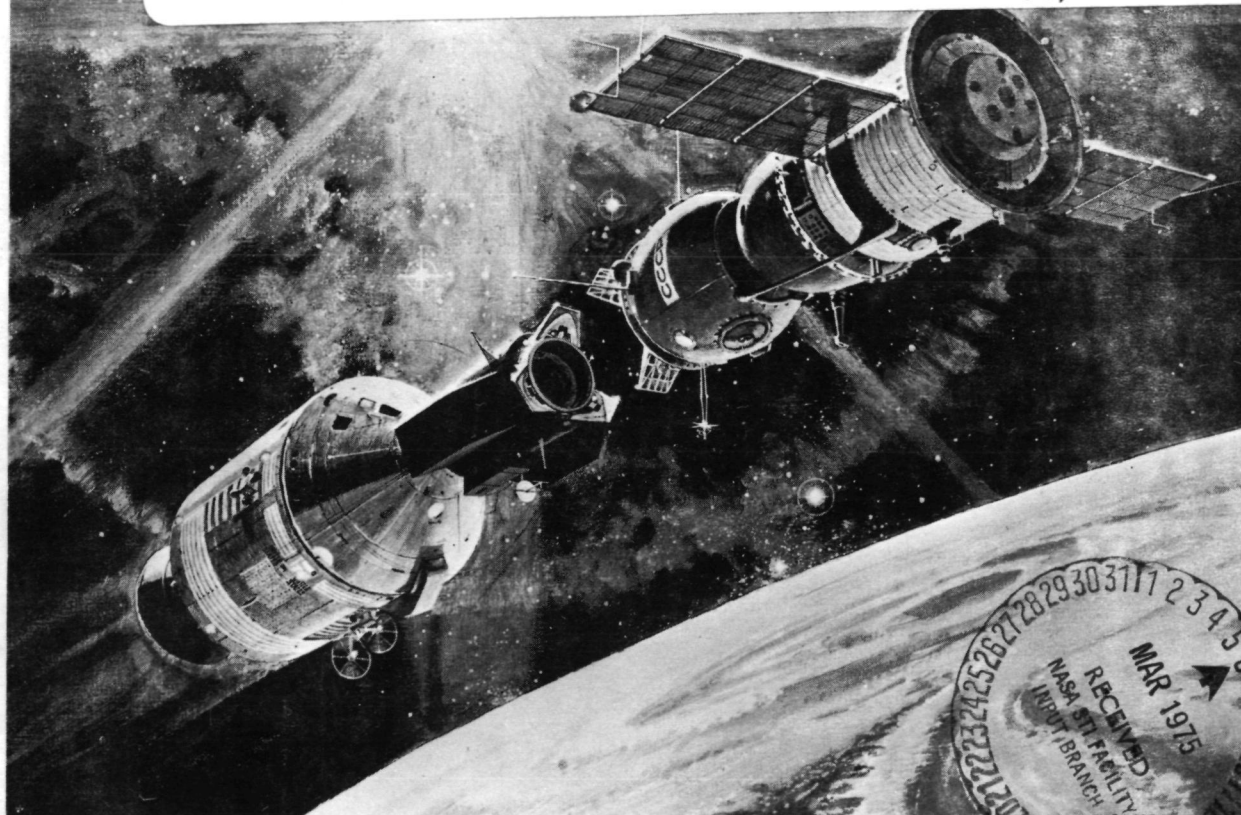
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APOLLO SOYUZ TEST
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Экспериментальный
проект
«Союз» - «Аполлон»

TABLE OF CONTENTS

ASTP General.....	1
Command and Service Module.....	2
Docking Module and Docking System.....	2-3
Soyuz Spacecraft.....	3
Launch Vehicle.....	3
Planned Mission Summary.....	9-11
ASTP Experiments.....	11-20
U.S. Space Vehicle Configuration.....	22
Crew Assignments.....	22
ASTP Funding and Budget Request.....	23
ASTP Major Contractors.....	23-24
Astronaut Biographies.....	26-40
Cosmonaut Biographies.....	42-49

APOLLO SOYUZ TEST PROJECT

Years of combined effort and cooperation between the world's leading space powers will culminate in mid-1975 with history's first international manned space mission.

A milestone in international space cooperation was achieved on May 24, 1972, when the United States and the Soviet Union agreed on the organization, development, scheduling, and conduct of a test docking mission in Earth orbit.

The Apollo Soyuz Test Project (ASTP) calls for the docking of a United States Apollo and a Soviet Union Soyuz spacecraft in Earth orbit to test compatible rendezvous and docking equipment and procedures. A major goal of the mission will be the performance of 27 space experiments. Five of the experiments will be conducted jointly by the astronauts and cosmonauts during the joint phase of the mission. The remaining experiments will be performed by the U.S. astronauts and will be spread over the 9-day span of the flight.

The major objective of the program will be the inflight testing of a jointly-designed international docking mechanism. Also, experience will be gained for the conduct of potential joint flights by the U.S. and USSR spacecraft, including, in case of necessity, rendering aid in emergency situations.

Joint U.S./USSR working groups have been meeting on a scheduled basis, both in the U.S. and USSR, to review and agree on the technical and operational aspects of the joint project.

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January 10, 1975

Command and Service Module

The Apollo spacecraft will be a modified version of the Command and Service Module (CSM) flown during the first several lunar landing missions. Major CSM modifications include provisions for experiments, additional propellant tanks for the reaction control system and the addition of controls and displays required for the proper operation of the Docking Module and docking system.

Docking Module and Docking System

The Docking Module is cylindrical, approximately 1.5 meters (about 5 feet) in diameter and 3 meters (about 10 feet) in length. It will serve as an airlock for the internal transfer of crewmen between the different atmospheres of the Apollo and Soyuz spacecraft. The Docking Module will be equipped with radio and TV communications, antennas, stored gases, heaters, and the displays and controls necessary for transfer operations.

The Docking Module is designed to handle two crewmen simultaneously. Hatches, having controls on both sides, will be installed at each end of the module. A universal docking system will be located at the Soyuz end of the module and will be capable of functioning with similar components on the Soyuz spacecraft. The Apollo end of the Docking Module will use the probe and drogue docking system used during the Apollo lunar program to permit docking between the Command Module and Lunar Module.

In orbit, Apollo's atmosphere is pure oxygen at a pressure of five pounds per square inch. Soyuz uses a mixture of nitrogen and oxygen at an Earth sea level pressure of 14.7 pounds per square inch. (Later NASA spacecraft such as the Space Shuttle will use nitrogen-oxygen at sea level pressure.)

While the spacecraft are docked, the Soyuz pressure will be reduced from its normal 14.7 pounds per square inch to 10 pounds. This will make it possible for crewmen to transfer from Soyuz to Apollo without taking time in the airlock to breathe pure oxygen and force nitrogen from their blood. Apollo pressure will remain at five pounds.

The Docking Module design emphasized low cost construction made possible by the launch weight margin inherent in the use of the Saturn IB launch vehicle. Thick aluminum plate was used rather than honeycomb, resulting in a considerable reduction in structural cost.

Soyuz Spacecraft

The Soviet Soyuz will also be modified. One important modification will be the use of a compatible rendezvous and docking system which NASA and Soviet engineers have designed. This system will also be employed on the end of the Docking Module with which Soyuz will dock.

Soyuz has been the primary Soviet manned spacecraft since its introduction in 1967. It consists of three basic modules:

- Orbital module, located at the forward end, used by the crew for work and rest during orbit. It is 3.35 meters (7.3 feet) in diameter, 2.65 meters (8.7 feet) long, and weighs about 1,224 kg (2,700 pounds).

- Descent module, with main controls and crew couches, used by crew during launch, descent, and landing. It weighs about 2,802 kg (6,200 pounds) and is 2.2 meters (7.2 feet) long.

- Instrument module, at rear, with subsystems required for power, communications, propulsion, and other functions. It weighs 2,654 kg (5,850 pounds) and is 2.3 meters (7.5 feet) long.

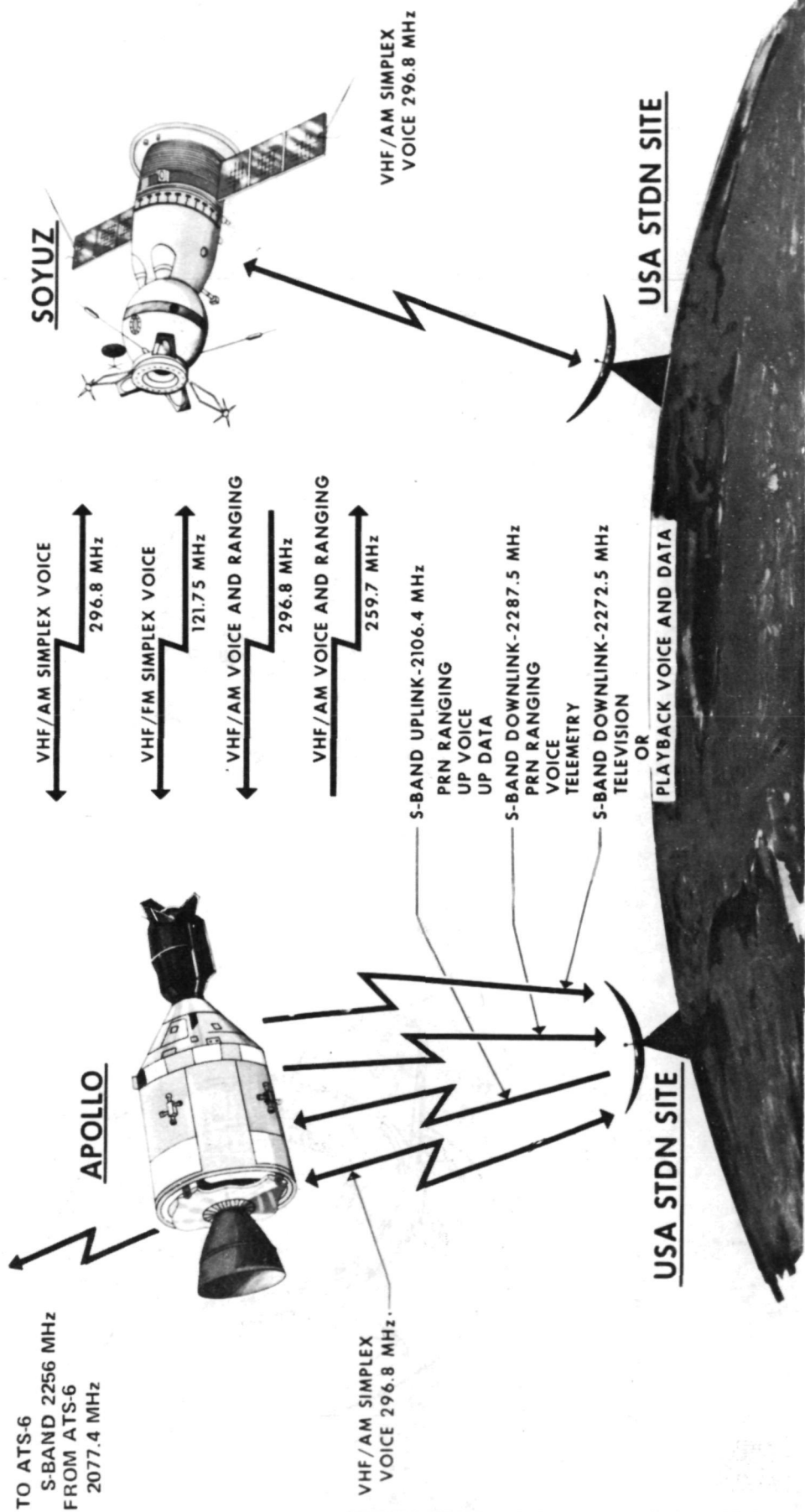
Launch Vehicle

ASTP will utilize Apollo-Skylab Saturn IB launch vehicle hardware. The Saturn IB, consisting of an S-IB stage, an S-IVB stage, and an instrument unit, will launch the spacecraft from the Kennedy Space Center.

NASA HQ MA74-5961
9-10-74

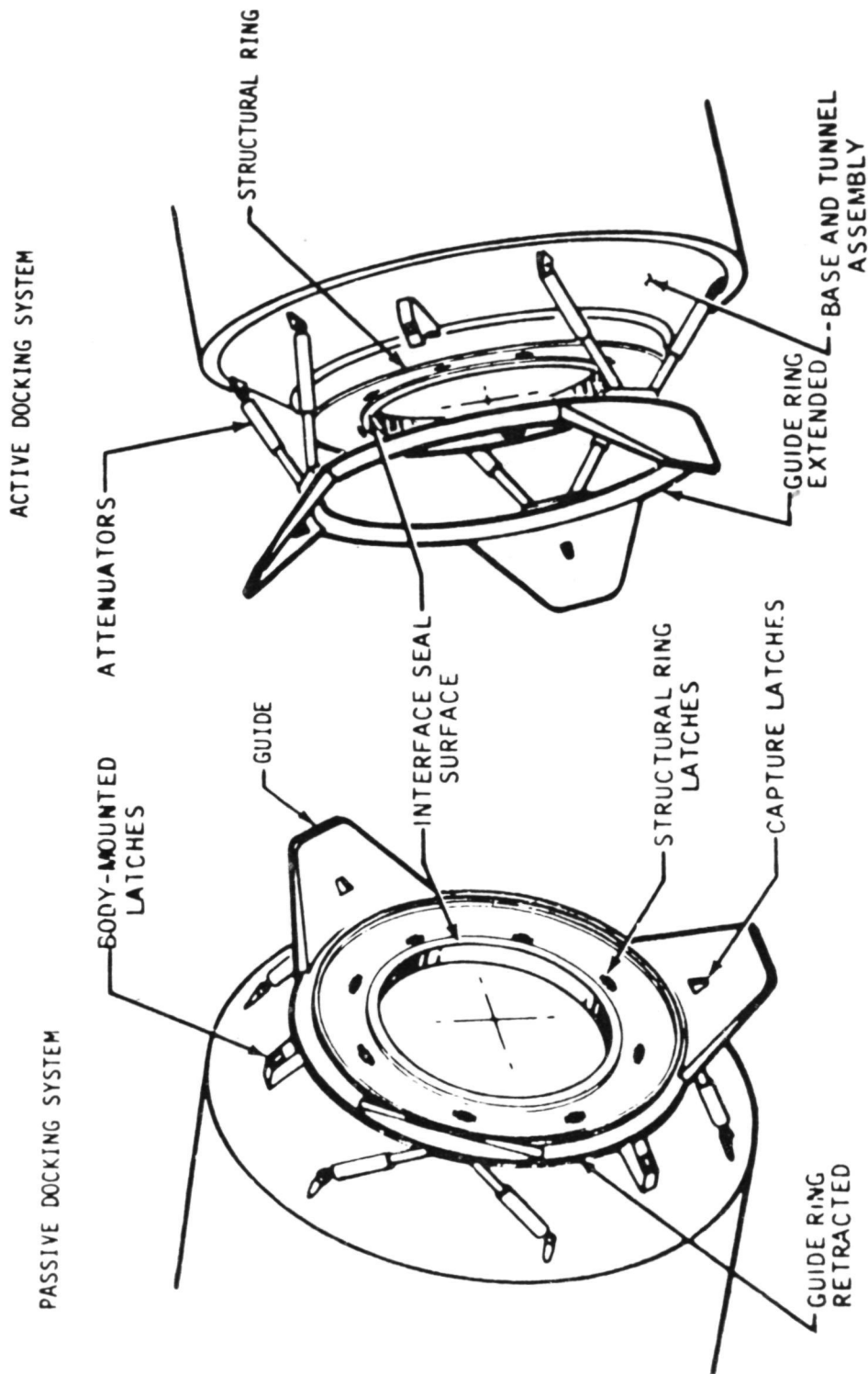
APOLLO-SOYUZ

APOLLO-SOYUZ TEST PROJECT COMMUNICATIONS SYSTEM



MA-74-5860
B-9-74

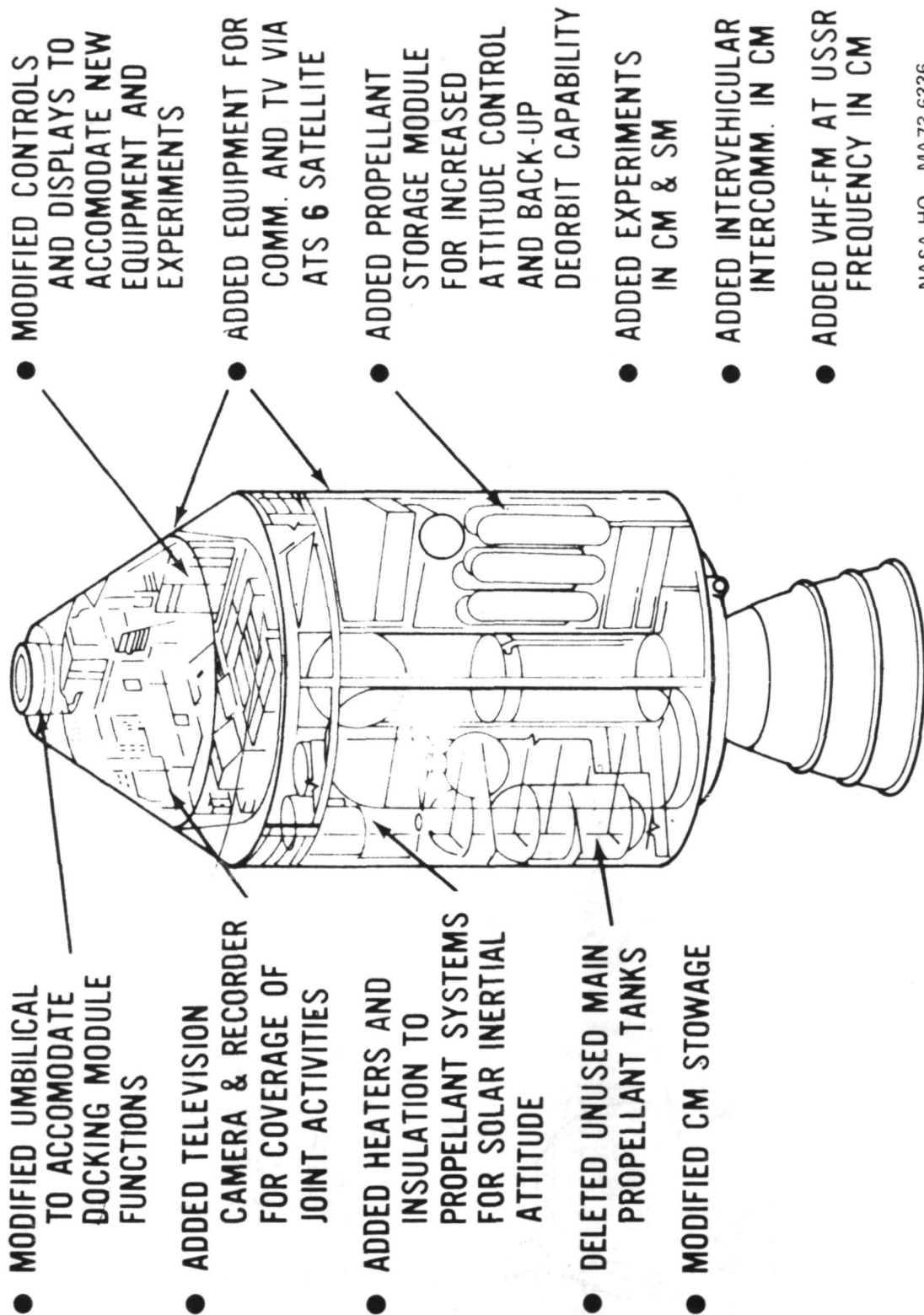
ASTP NEW COMPATIBLE DOCKING SYSTEM



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ASTP MAJOR APOLLO MODIFICATIONS

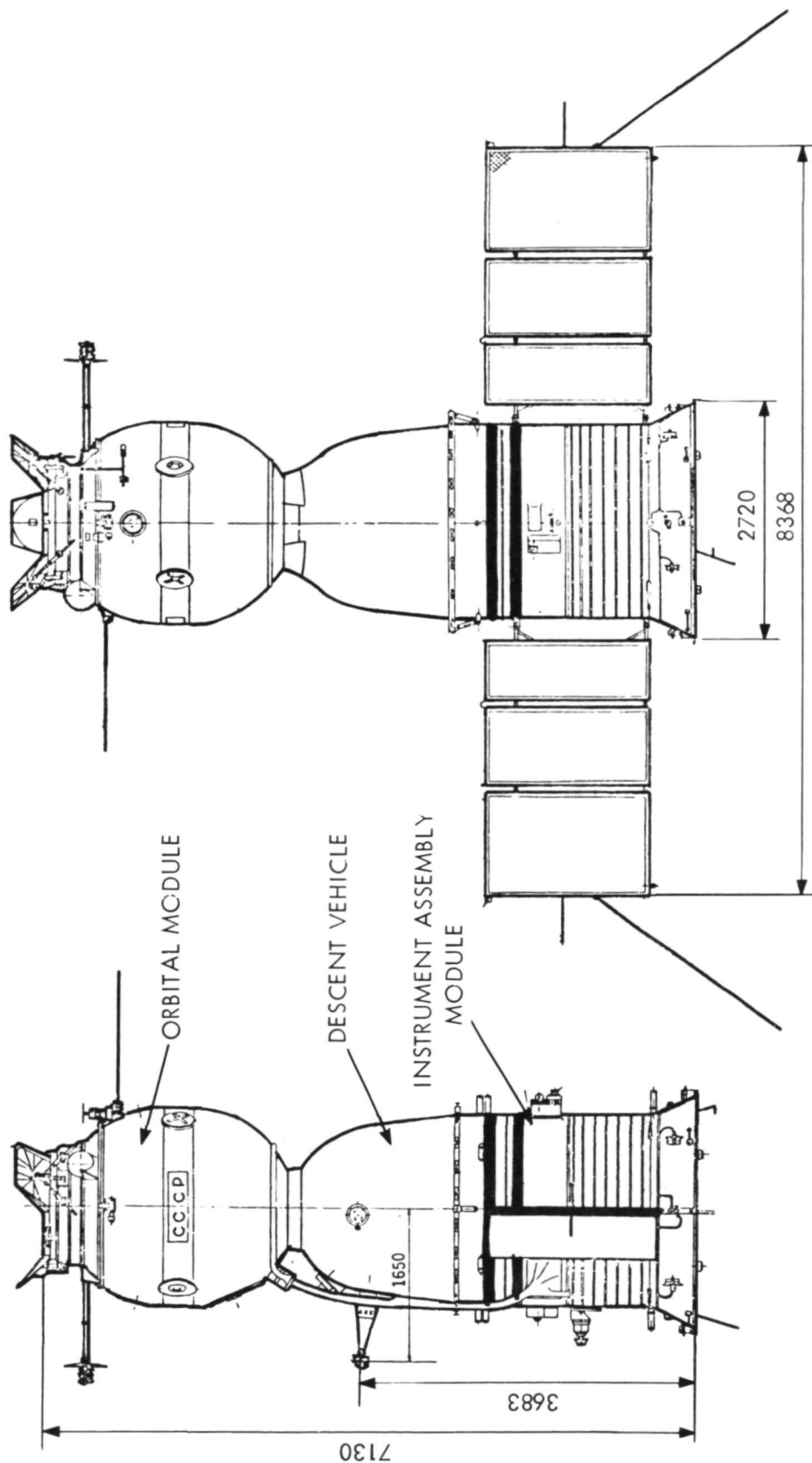
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NASA HQ MA73-6336

Revised 12-6-74

SOYUZ VEHICLE



Planned Mission Summary

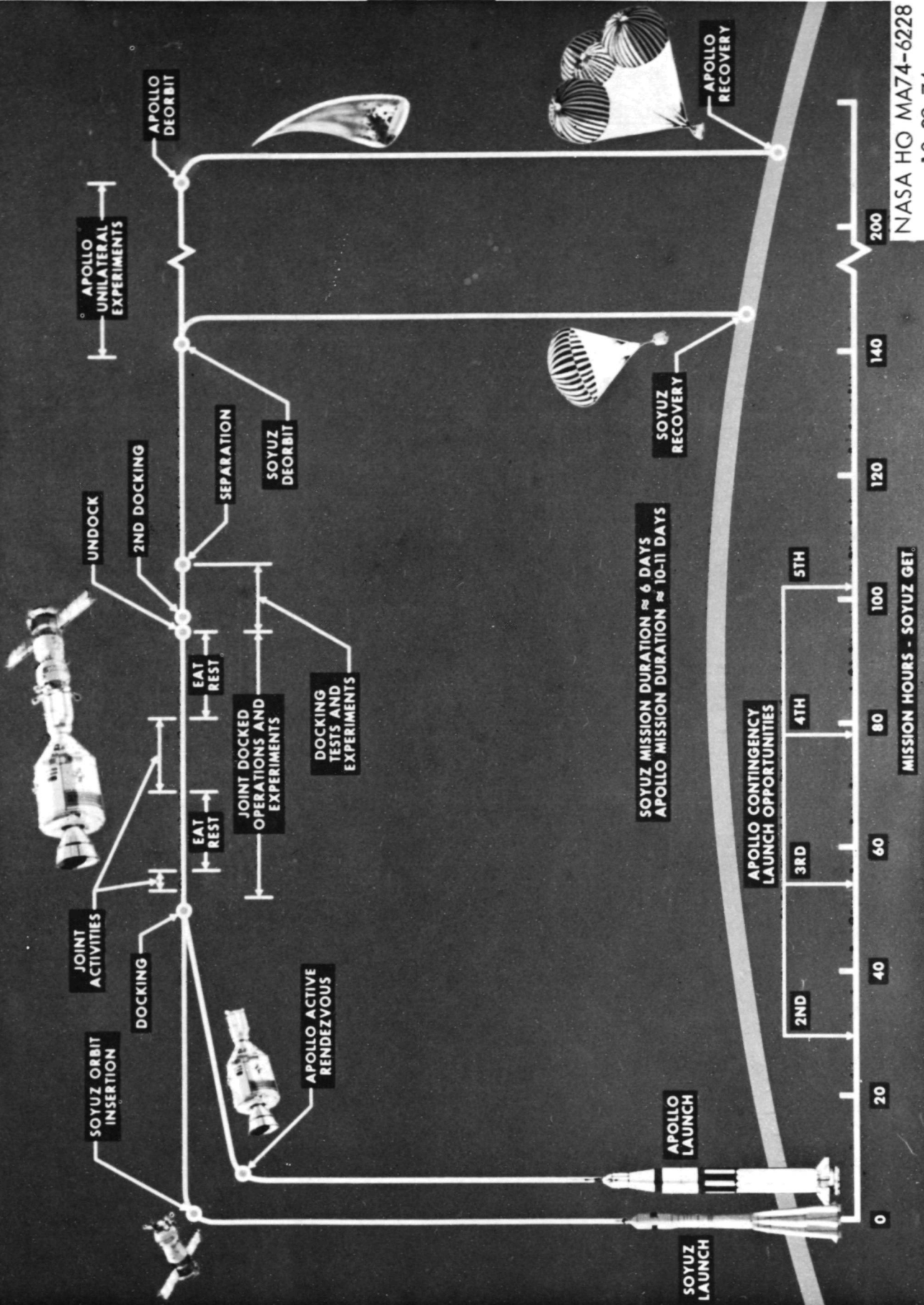
The Soyuz will be launched from Baikonur, Kazakhstan launch complex at about 1220 GMT* on July 15, 1975, in a northeasterly direction and is inserted into a 188- by 228-km (117- by 142-statute mile) orbit at an inclination of 51.8° . On the fourth orbit after lift-off the Soyuz will initiate the first of two maneuvers to circularize the orbit at 225 km (140 statute miles). The second maneuver for circularization will occur on the 17th Soyuz orbit.

About seven hours 30 minutes after Soyuz launch (1950 GMT), the Apollo will be launched from the Kennedy Space Center in a northeasterly direction and will be inserted into a 150- by 167-km (83- by 104-statute mile) orbit with an inclination of 51.8° . About 1 hour after Apollo orbit insertion, the Apollo CSM will begin the transposition and docking procedure to extract the Docking Module (DM) from the launch vehicle. The extraction of the DM will be completed by 9 hours 14 minutes Soyuz, Ground Elapsed Time (GET). An evasive maneuver of 1 meter per second (MPS) (3.3 feet per second) posigrade to avoid recontact with the launch vehicle will raise apogee to about 167 km (104 statute miles).

The Apollo spacecraft will perform a circularization maneuver at third apogee to establish a controlled Apollo rendezvous maneuver sequence. The rendezvous sequence establishes a standard geometry final approach to the Soyuz spacecraft. The first phasing maneuver (NC1), which occurs at about 13 hours 12 minutes Soyuz GET, is an in-plane, horizontal maneuver designed to adjust the rate of change of the phase angle by changing the orbital period. If necessary, a plane change maneuver (NPC) will be performed after NC1 and before the second phasing maneuver to place the Apollo in plane with the Soyuz at rendezvous. The plane change maneuver will complete the first day of maneuver activities for each crew.

* Moscow time is obtained by adding 3 hours to Greenwich Mean Time. Eastern Standard Time is obtained by subtracting 5 hours from Greenwich Mean Time.

APOLLO SOYUZ TEST PROJECT MISSION PROFILE



NASA HQ MA74-6228
10-29-74

The Soyuz circularization maneuver to establish the final rendezvous and docking orbit will occur on the 17th Soyuz orbit. Eight hours later, at about 32 hours 22 minutes, a nominally zero phasing correction maneuver (PCM) is scheduled for the Apollo which would correct for any phasing errors which might have occurred at NC1 and at the Soyuz circularization maneuver. The second phasing maneuver (NC2), at 48 hours 34 minutes Soyuz GET, is an in-plane, horizontal maneuver to adjust the altitude difference with respect to the Soyuz. Following NC2, the corrective combination maneuver (NCC) is performed at 49 hours and 18 minutes Soyuz GET. The NCC maneuver controls the phasing, the differential altitude, and the differential plane between the two spacecraft at the co-elliptic maneuver point. Finally, the coelliptic maneuver (NSR), at 49 hours and 55 minutes Soyuz GET, establishes an orbit which maintains a near constant differential altitude between the two spacecraft.

Docking will occur prior to darkness which is at 1645 GMT, during the 36th Soyuz orbit. The time of docking on the 29th Apollo revolution is approximately 51 hours 55 minutes Soyuz GET.

The amount of time which will be spent with the Apollo docked to the Soyuz is approximately 2 days. After final undocking from the Soyuz (following redocking exercises), at approximately 99 hours 15 minutes Soyuz GET, the Apollo will perform a 1 mps posigrade maneuver to avoid recontact, after which each spacecraft will conduct independent activities. The Soyuz will continue in orbit for approximately 43 hours after separation, landing at about 142 hours 30 mins., Soyuz GET in Kazakhstan. The Apollo will continue in orbit for approximately $3\frac{1}{2}$ days after separation, landing in the Pacific Ocean near Hawaii.

ASTP Experiments

Extreme UV Survey (MA-083) -- The purpose is to search for Extreme Ultraviolet (EUV) radiation from celestial objects. The discovery of a class of EUV sources would open up a new branch of astronomy and provide important information on the interstellar medium. It has been hypothesized that such objects exist and are located relatively nearby (stellar coronas, defunct pulsars, accreting matter stars) but no systematic EUV searches have been made. A flux collecting grazing incidence telescope with an EUV

detector at its focal point will be employed. Band pass discrimination will be achieved through a combination of the reflecting efficiency of the mirrors, the spectral response of the detector, and a thin metallic band pass filter.

Principal Investigator: Dr. C. S. Bowyer
University of California,
Berkeley

Helium Glow (MA-088) -- The purpose is to measure the intensity and spatial distribution of helium fluorescent radiation in selected regions of the night sky. The measurements will give the distribution of helium in interplanetary space and indicate the penetration of interstellar helium into the solar system. A systematic mapping of this radiation will be performed; the observations can then be compared with a number of existing theories. A narrow band-pass photometer, with wide field-of-view, will be employed. The spectral resolution will be obtained with a narrow band-pass thin metallic filter with the primary sensing element being a photoelectric surface.

Principal Investigator: Dr. C. S. Bowyer
University of California,
Berkeley

UV Absorption (MA-059) -- The purpose is to measure the concentration of atmospheric species, especially atomic oxygen and atomic nitrogen, by UV absorption and resonance scattering spectroscopy in the medium between the CSM and the Soyuz spacecraft. Direct measurements of atomic oxygen and atomic nitrogen are difficult to interpret because of chemical reactions in a mass spectrometer and, therefore, a new approach is being used to make use of both spacecraft. The separation of the two spacecraft will be varied to eliminate absorption effects of contaminants around either spacecraft. The field-of-view of the detector can be turned to look at light resonantly scattered by atmospheric constituents when Soyuz is absent. The source and the detector will be externally mounted on the spacecraft.

Principal Investigator: Dr. Thomas Donahue
University of Michigan

Soft X-Ray (MA-048) -- The purpose is twofold: (1) to produce a map of celestial soft x-ray emissions (0.1 to 1.0 Kev) and (2) to record the spatial dependence and time variability of atmospheric x-ray emissions connected with auroral activity. No systematic sky-survey has been made in the 0.1 to 1.0 kev energy range, but rocket observations have detected a diffuse background of celestial soft x-ray emissions. X-ray emissions from an aurora provide a sensitive indication of the incoming electron flux. A proportional counter will be externally mounted on the spacecraft; some spacecraft pointing at specific known objects is required.

Principal Investigator: Dr. Herbert Friedman
U.S. Naval Research Laboratory

Doppler Tracking (MA-089) -- The purpose is to detect and measure localized anomalies of the earth's gravity field. This experiment will test the low satellite pair approach to meeting GRAVSAT mission objectives. Disciplines benefiting from this experiment are earth physics, i.e. science of gravity field structure and plate tectonics. This experiment will make use of the existing Apollo VHF ranging system and recorder with a modification to make the ranging system partially phase coherent.

Principal Investigator: Dr. G. C. Weiffenbach
Dr. M. D. Grossi
Smithsonian Astrophysical Observatory

Multipurpose Furnace (MA-010) -- The purpose is to provide a means to perform experiments on solidification, crystal growth, and other processes involving phase changes in various types of materials. At least two semiconductor crystal growth, two controlled solidification and two spontaneous weightless effect experiments are to be conducted; one USSR sponsored experiment will also be performed. The furnace system is upgraded in a manner as suggested by the experience gained on Skylab. The furnace system is comprised of two units: the Multipurpose Furnace and the Control Package. The furnace provides three experiment chambers which have a hot zone, thermal gradient section, and a heat extraction section. The Control Package regulates the temperature of the hot zone, permits selection of the amount of soak time desired, cools the furnace at a predetermined rate, and shuts down the system. The instrument is located in the DM. The seven experiments associated

with the multipurpose experiment are as follows:

Surface Tension Induced Convection (MA-041)

Principal Investigator: Dr. R. E. Reed
Oak Ridge National
Laboratories

Monotectic and Syntectic Alloys (MA-044)

Principal Investigator: Dr. C. Y. Ang
Northrop Corporation

Interface Marking in Crystals (MA-060)

Principal Investigator: Dr. Harry C. Gatos
Massachusetts Institute
of Technology

Zero-G Processing of Magnets (MA-070)

Principal Investigator: Dr. D. J. Larson
Grumman Aerospace Corp.

Crystal Growth From the Vapor Phase (MA-085)

Principal Investigator: Dr. Hervert Wiedemeier
Rensselaer Polytechnic
Institute

NaCl-LiF Eutectic (MA-131)

Principal Investigator: Dr. Alfred S. Yue
UCLA

USSR Multiple Material Melting (MA-150)

Principal Investigator: Dr. I. Ivanov
Soviet Academy of Sciences

Electrophoresis German (MA-014) -- The purpose is to verify the electrophoresis concept in zero - "g"; to test the quality of separation at high sample flow rates; and to demonstrate the possibility of separating cells for clinical applications. A continuous flow apparatus is used to separate stained erythrocytes, live lymphocytes, and stem cells. The new data from these samples will provide information on the differentiation of cells responsible for production of antibodies and red blood cells. Maneuvering of the spacecraft should be held to a minimum during the two hours of experiment operation. The parts of this experiment to be returned to earth are the photographic data taken while the experiment was being operated and the experiment equipment.

Principal Investigator: Prof. Kurt Hannig
Max Planck Institute
Germany

Microbial Exchange (AR-002) -- The purpose is to quantitatively monitor the microbial load and defense level of both crews and both vehicles. The ASTP mission offers a unique opportunity to assess the microbial interchange between two spacecraft and the crew as well as changes in their microbial flora from both aspects of susceptibility and immunity responses. The USSR delegation has expressed a high interest in this experiment. Samples will be collected at predesignated prelaunch times, during flight, and at preselected post-recovery times. An experiment package will be required for stowage in the Soyuz.

Principal Investigator: Dr. G. R. Taylor
NASA Johnson Space Center

Zone Forming Fungi (MA-147) -- The purposes are to determine the effect of local radiation factors on zone-forming rhythms (puschino strain) of fungus cultures and study possible changes in cultural properties (somatic and genetic changes) of the strain after space flight. The sample devices provided by the USSR will be launched on-board both the Apollo and Soyuz spacecraft with one set of samples being exchanged during the docked portion of flight. Photographs of the samples are to be taken at specified intervals during the flight of the developing fungal colonies.

Principal Investigator: Dr. I. G. Akoev
USSR

Dr. A. Nicogossian
US Point of Contact

Light Flash (MA-106) -- The purpose is to correlate astronaut-observed light flashes in an instrumented light tight mask. It is desired to determine the efficiency of detection of charged particles such as galactic cosmic primaries that penetrate the atmosphere and geomagnetic earth shields sufficiently to interact with the central nervous system of the crew when in selected sectors of the orbit. The equipment is designed to ascertain at what frequency cosmic rays can be detected by the crew, what is the latitude dependence of this phenomena, and to ascertain if there are any other sensory phenomena from the particles that do in fact interact with other sensory tissue such as the cochlear nerve or organ of corti.

Principal Investigator: Dr. T. F. Budinger
Lawrence Radiation Laboratory
University of California,
Berkeley

Artificial Solar Eclipse (MA-148) -- The purpose is to obtain photometric characteristics of the solar corona and the gaseous environment surrounding at the Apollo spacecraft. The Apollo spacecraft will be used to create an artificial eclipse of the sun with respect to the Soyuz spacecraft. The Apollo spacecraft would be required to perform a -X translation at undocking as accurately as possible. However, because the U.S. cannot provide a guarantee regarding the length of time the Apollo shadow would remain on Soyuz, alternate solutions are to be analyzed and discussed.

Principal Investigator: Dr. G. M. Nikolsky
USSR
Dr. Tom Giuli
US Point of Contact

Geodynamics (MA-128) -- The purposes are: to evaluate the technique of tracking a spacecraft by range and range-rate measurement data relayed to a ground station via a communications relay satellite (ATS-F), and to determine any local anomalies of the earth's gravity field. This experiment is complementary to the Doppler experiment. Some specific attitude orientation will be required to obtain the necessary data.

Principal Investigator: Dr. F. O. Vonbun
Goddard Space Flight Center

Biostack (MA-107) -- The purpose is to investigate the biological effects of cosmic radiation and charged particles (HZE) during the space flight. The biostack consists of layers of several selected kinds of biological materials stacked alternately with different physical track detectors. The biological effects of galactic cosmic particles (HZE) under consideration are: molecular and cellular inactivation; damage to nuclear and other sub-cellular systems; induction of mutations leading to genetic information gained will extend and expand on the earlier information obtained from the Apollo 16 and 17 missions. The Biostack is to be placed in the CM in a location where shielding to the ambient cosmic radiation is as low as possible.

Principal Investigator: Prof. Horst Bucker
University of Frankfurt
Germany

Crystal Growth (MA-028) -- The purposes of this experiment are: to determine whether large, high-quality single crystals of insoluble compounds can be grown by allowing two or more reactant solutions to diffuse toward each other through a pure water region in zero gravity; to obtain single crystals superior to those heretofore available for certain research and potential commercial applications; to obtain data for evaluating fully the theoretically predicted benefits of growing crystals by this and other zero gravity techniques and for improving the techniques. This experiment consists of an attempt to grow high-quality crystals of insoluble compounds in zero gravity at room temperature in water solutions by allowing reagents to diffuse into the water and react to form compounds. High temperature crystal growth methods performed on earth complicated by phase transformations which can result in various kinds of defects. The favorable results of the vapor transport crystal growth experiment flown on Skylab has generated the interest in this experiment. This experiment will be stowed in the CM.

Principal Investigator: Dr. M. D. Lind
Science Center
Rockwell International Corporation

Stratospheric Aerosol Measurement (MA-007) -- The purpose of this experiment is to measure the concentration and vertical distribution of aerosols in the stratosphere. Solar extinction will be measured by a photometer operating in the near infrared region of the spectrum in order to assess the use of this measuring technique in determining stratospheric constituents and concentration. Measurements will be performed while the spacecraft is approaching sunset or sunrise.

Principal Investigator: Dr. T. J. Pepin
University of Wyoming

Electrophoresis Technology (MA-011) -- The purposes of the Static Electrophoresis System are: to conduct engineering and operational tests of a space-rated static electrophoretic separation apparatus that embodies major features of the technology needed for future electrophoresis operation in space and to ascertain any benefits to current research in medicine, biology, or other fields that may be achievable through experimental operations with the apparatus. This experiment will be a continued development of the static fluid electrophoresis technology carried out during the Apollo 14 and 16 missions and does not duplicate any of the technology objectives of electrophoresis experiment

MA-014. It will attempt to evaluate the performance of several zonal separation methods and eliminate sedimentation problems encountered here on earth. This method is usually satisfactory for separating low molecular weight materials but is impractical for high molecular weight materials. Since the purpose of this technique is to verify and confirm an anticipated behavior, all flight data will be carefully compared with ground tests and established control limits. The actual sample capsules and film magazine are to be returned for performing the analysis.

Principal Investigator: Dr. Robert S. Snyder
NASA Marshall Space Flight Center

Earth Observations and Photography (MA-136) -- The purpose of this experiment is to gather photographic and observational data in support of on-going research in the broad fields of geology, hydrology, and oceanography as well as observational data pertaining to meteorology. Included within this experiment is the Himalayan Snow proposal of Dr. Pisharoty who is to be considered the Principal Investigator for that portion of the photography. Dr. F. El-Baz, the Principal Investigator, will detail the photographic requirements of Dr. Pisharoty.

Principal Investigator: Dr. Farouk E. Baz
Smithsonian Institution
National Air and Space Museum

Cellular Immune Response (MA-031) -- The purpose is to characterize lymphocytic types and to evaluate lymphocytes for their responsiveness pre- and post-flight. The experiment requires analysis of pre- and post-flight blood samples.

Principal Investigator: Dr. B. Sue Criswell
Baylor College of Medicine

Polymorphonuclear Leukocyte Response (MA-032) -- The purpose is to evaluate the ability of human polymorphonuclear leukocytes to function properly in the disease prevention process following spaceflight. The ability of the white blood cells to protect the body from bacterial infection will be evaluated. This test of the leukocyte function will be evaluated before, immediately after, and at selected intervals after recovery of the crew. The experiment complements the human cellular immune response experiment and will be performed with pre- and post-flight blood samples.

Principal Investigator: Dr. R. R. Martin
Baylor College of Medicine

Crystal Activation (MA-151) -- The immediate objective is to measure the radioactivity of crystals caused by cosmic protons and secondary neutrons and protons produced in the spacecraft. Information will be gathered on space radiation in the energy range of 50 Kev to 10 Mev. Two cylindrical containers will be stowed in the spacecraft. The first is a NaI crystal detector identical to those flown on Apollo 15, 16 and 17. The other will contain Germanium and a number of metals selected to yield information on the nature of the particle flux. The crystals will be analyzed as soon as possible after spacecraft recovery.

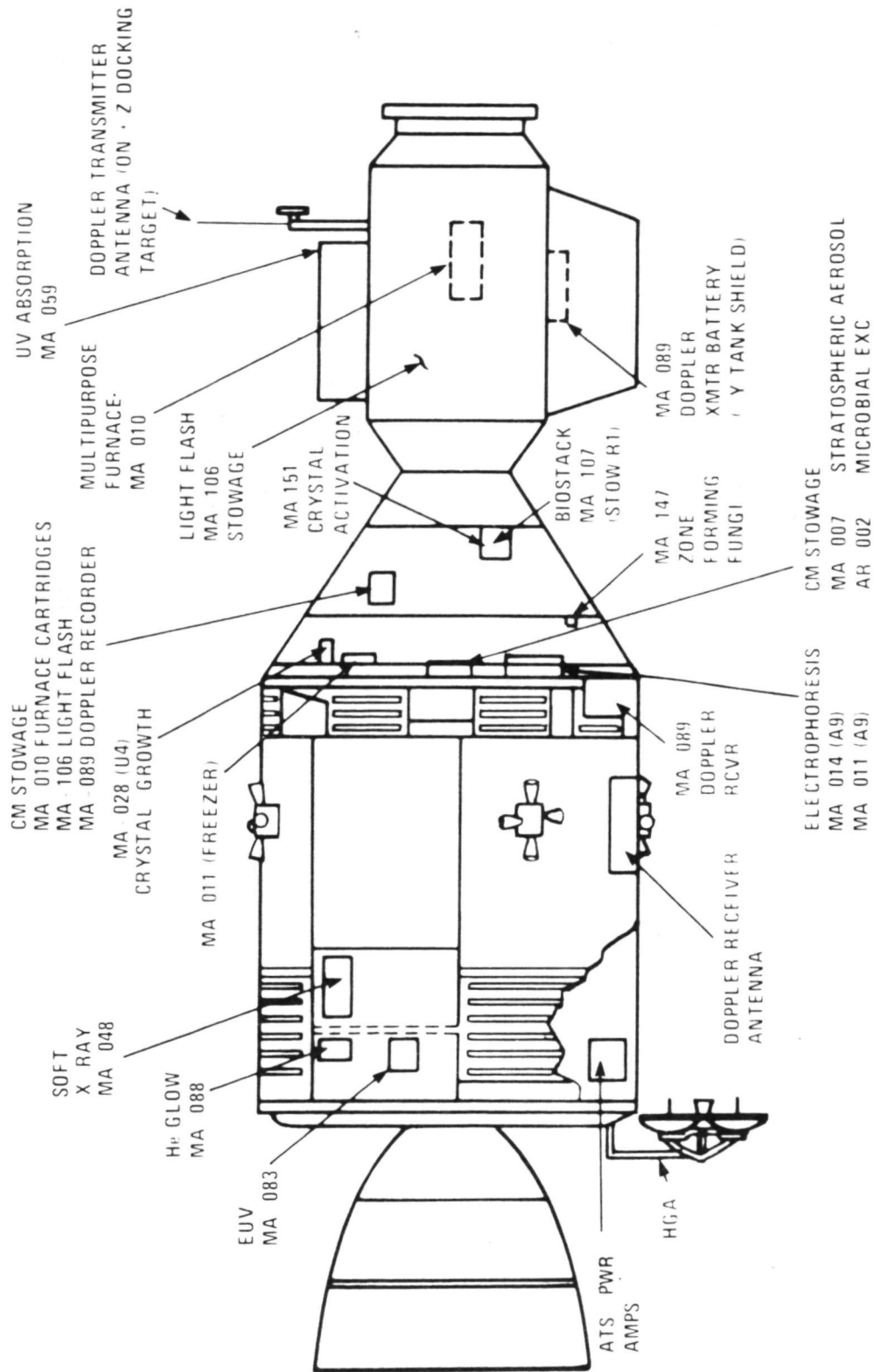
Crystal activated radiation is an important data background for Gamma radiation measurements in space, since the radiation from the activated crystal is difficult to differentiate from the Gamma radiation. These independent ASTP measurements of the crystal activation will be instrumental in correcting past and future Gamma-ray space measurements.

Principal Investigator: Dr. J. Trombka
Goddard Space Flight Center

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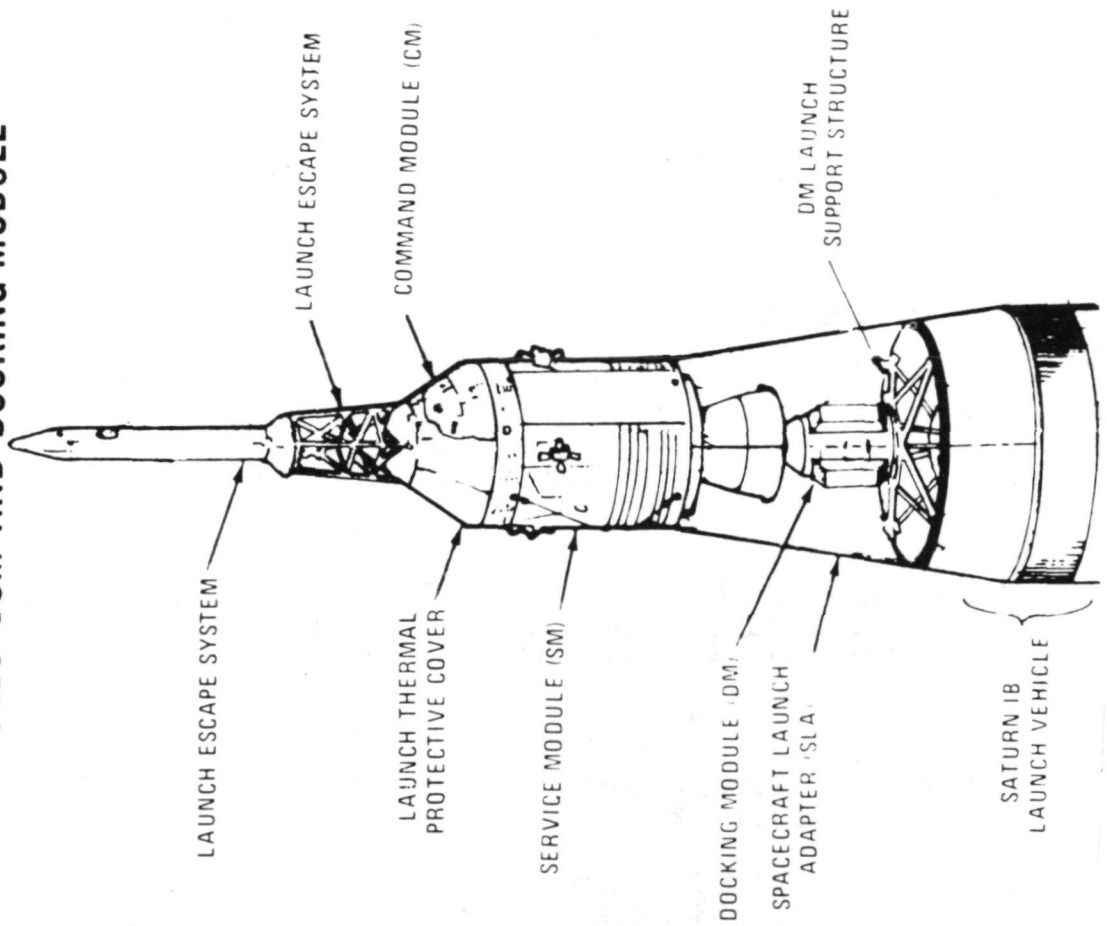
EXPERIMENTS AND ATS-6 LOCATION SCHEMATIC (CSM-III)



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APOLLO/SOYUZ TEST PROJECT

LAUNCH CONFIGURATION FOR APOLLO CSM AND DOCKING MODULE



ASAC 46-10471
10/1/71

U.S. Space Vehicle Configuration

The Saturn IB launch vehicle, Apollo spacecraft, and other major hardware designed for the Apollo/Soyuz Test Project mission will be as follows:

<u>Configuration</u>	<u>Designation Numbers</u>	
	<u>Prime</u>	<u>Back-up</u>
First Stage	S-IB-210	S-IB-209
Second Stage	S-IVB-210	S-IVB-209
Instrument Unit	S-IU-210	S-IU-209
Spacecraft - L/V Adapter	SLA-18	SLA-22
Docking Module	DM-2	DM-1
Docking System	DS-5	DS-7
Service Module	SM-111	SM-119
Command Module	CM-111	CM-119
Launch Complex	LC-39B	LC-39B

Crew Assignments

The crew assignments for the Apollo/Soyuz Test Project mission are:

U.S. Crew Assignment

	<u>Prime</u>	<u>Backup</u>
Commander (CDR)	Thomas P. Stafford	Alan L. Bean
Command Module Pilot (CMP)	Vance D. Brand	Ron E. Evans
Docking Module Pilot (DMP)	Donald K. Slayton	Jack R. Lousma

USSR Crew Assignment

Crew 1	Aleksei Leonov Valeri Kubasov	Crew 3	Vladimir Dzhanibekov Boris Andreyev
Crew 2	Anatoli Filipchenko Nikolai Rukavishnikov	Crew 4	Yuri Romanenko Alexander Ivanchenko

Apollo Soyuz Test Project
Funding and Budget Request

	<u>1973</u>	<u>1974</u>	<u>1975</u>
Command. and Service Module	\$12,600,000	\$32,300,000	\$ 8,000,000
Docking Module and docking system	21,000,000	21,700,000	3,400,000
Experiments*	-	8,000,000	5,000,000
Launch vehicle	-	9,500,000	32,500,000
Launch operations	-	8,900,000	45,000,000
Flight support and operations	<u>4,900,000</u>	<u>9,600,000</u>	<u>20,700,000</u>
Total	<u>\$38,500,000</u>	<u>\$90,000,000</u>	<u>\$114,600,000</u>

*Reprogramming will increase total for experiments to \$16,000,000.

ASTP Major Contractors

Rockwell International
Space Division
Downey, California

Command and Service Module,
Docking Module, Docking System,
Spacecraft Support

Rockwell International
Rocketdyne Division
Canoga Park, California

Saturn Engines and Support

General Electric Company
Valley Forge Space Center
Philadelphia, Pennsylvania

Automatic Checkout Equipment
(ACE) Support
Launch Vehicle Ground
Support Equipment

Chrysler Corporation
Space Division
New Orleans, Louisiana

S-IB Stage and Launch Support

McDonnell Douglas Corporation
Huntington Beach, California

S-IVB Stage and Launch Support

IBM Federal Systems Division
Gaithersburg, Maryland

Instrument Unit and IU Launch
Support

ILC Industries
Dover, Delaware

Space Suits

The Boeing Company
Seattle, Washington

Reliability and Quality
Assurance at JSC
Launch Complex 39

Xerox Corporation
Rockville, Maryland

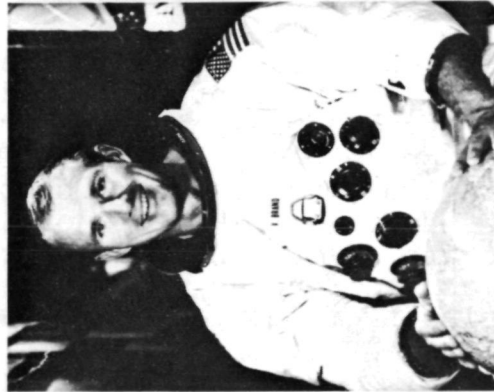
Digital Evaluator

Bendix Corporation
Peterboro, New Jersey

ST-124 Platform

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ASTP PRIME CREW



T.P. STAFFORD-CDR			V. BRAND-CMP		D.K. SLAYTON-DMP	
ASTRONAUT SELECTION	SEPTEMBER 1962		APRIL 1966		APRIL 1959	
SPACE MISSIONS FLOWN	GT, 6A, 9A AND APOLLO 10		SUPPORT CREW ON APOLLO 8 & 13 BACKUP CMP FOR APOLLO 15		REMOVED FROM FLYING STATUS PRIOR TO MERCURY 7 MISSION; RETURNED TO FLIGHT STATUS IN MARCH 1972	
TIME IN SPACE	290 HRS. 15 MIN.		BACKUP CREWMEMBER FOR SL 2 & 3			
EDUCATION	USNA, BS OKLAHOMA CITY, HON. DS		UNIV. OF COLORADO, BSBA & BSAE UCLA, MBA		UNIV. OF MINNESOTA, BSAE	
ORGANIZATIONS	EXPERIMENTAL TEST PILOTS		EXPERIMENTAL TEST PILOTS AIAA SIGMA NU BETA GAMMA SIGMA		EXPERIMENTAL TEST PILOTS AIAA	
PHYSICAL DATA						
BIRTH	SEPTEMBER 1930		9 MAY 1931		1 MARCH 1924	
HEIGHT	6 FT.		5 FT. 11 IN.		5 FT. 10 IN.	
APPROX. WEIGHT	~ 175 LBS.		~ 175 LBS.		~ 160 LBS.	

ASTRONAUT BIOGRAPHIES

NAME: Thomas P. Stafford (Brigadier General, USAF)
Deputy Director, Flight Crew Operations

BIRTHPLACE AND DATE: Born September 17, 1930, in Weatherford, Oklahoma. His mother, Mrs. Mary Ellen Stafford, is a resident of Weatherford.

PHYSICAL DESCRIPTION: Black hair; blue eyes; height: 6 feet; weight: 175 pounds.

EDUCATION: Graduated from Weatherford High School, Weatherford, Oklahoma; received a Bachelor of Science degree from the United States Naval Academy in 1952; recipient of an Honorary Doctorate of Science from Oklahoma City University in 1967, an Honorary Doctorate of Laws from Western State University College of Law in 1969, an Honorary Doctorate of Communications from Emerson College in 1969, and an Honorary Doctorate of Aeronautical Engineering from Embry-Riddle Aeronautical University in 1970.

MARITAL STATUS: Married to the former Faye L. Shoemaker of Weatherford, Oklahoma. Her parents, Mr. and Mrs. Earle E. Shoemaker, reside in Thomas, Oklahoma.

CHILDREN: Dionne, July 2, 1954; Karin, August 28, 1957.

RECREATIONAL INTERESTS: His hobbies include handball, weight lifting, and swimming.

ORGANIZATIONS: Fellow of the American Astronautical Society and member of the Society of Experimental Test Pilots and the Explorers Club.

SPECIAL HONORS: Awarded the NASA Distinguished Service Medal, two NASA Exceptional Service Medals, the JSC Certificate of Commendation (1970), the Air Force Command Pilot Astronaut Wings, and the Air Force Distinguished Flying Cross; and co-recipient of the AIAA Astronautics Award, the 1966 Harmon International Aviation Trophy, the National Academy of Television Arts and Sciences Special Trustees Award (1969), and an Honorary Lifetime Membership in the American Federation of Radio and Television Artists.

Stafford:2

EXPERIENCE: Stafford, an Air Force Brigadier General, was commissioned in the United States Air Force upon graduation from Annapolis. Following his flight training, he flew fighter interceptor aircraft in the United States and Germany and later attended the USAF Experimental Flight Test School at Edwards Air Force Base, California.

He was Chief of the Performance Branch at the USAF Aerospace Research Pilot School at Edwards and responsible for the supervision and administration of the flying curriculum for student test pilots. He was also an instructor in flight test training and specialized academic subjects -- establishing basic textbooks and directing the writing of flight test manuals for use by the staff and students. He is co-author of the Pilot's Handbook for Performance Flight Testing and the Aerodynamics Handbook for Performance Flight Testing.

He has logged more than 6,200 hours flying time, which includes more than 5,100 hours in jet aircraft.

CURRENT ASSIGNMENT: General Stafford was selected as an astronaut by NASA in September 1962. He served as backup pilot for the Gemini 3 flight.

On December 15, 1965, he and command pilot Walter M. Schirra were launched into space on the history-making Gemini 6 mission which performed the first rendezvous in space with the already orbiting Gemini 7 crew. Gemini 6 returned to Earth on December 16, 1965, after 25 hours, 51 minutes, and 24 seconds of flight.

Stafford made his second flight as command pilot of the Gemini 9 mission. During this 3-day flight which began on June 3, 1966, the crew performed three different types of rendezvous with the previously launched Augmented Target Docking Adapter; and pilot Eugene Cernan logged two hours and ten minutes outside the spacecraft in extravehicular activities. The flight ended after 72 hours and 20 minutes with a perfect reentry and recovery as Gemini 9 landed within 0.4 nautical miles of the designated target point and 1.5 miles from the recovery ship USS Wasp. (This is the closest entry and touchdown of any manned flight.)

Stafford:3

Following Gemini 9, Stafford served as backup commander for Apollo 7.

He was spacecraft commander of Apollo 10, May 18-26, 1969, the first comprehensive lunar-orbital qualification and verification flight test of an Apollo lunar module. Stafford was accompanied on the flight to the Moon by John W. Young (command module pilot) and Eugene Cernan (lunar module pilot). In accomplishing all mission objectives, Apollo 10 confirmed the operational performance, stability, and reliability of the command/service module/lunar module configuration during translunar coast, lunar orbit insertion, and lunar module separation and descent to within 8 nautical miles of the lunar surface. The latter maneuver employed all but the final minutes of the technique prescribed for use in an actual lunar landing and permitted critical evaluations of the lunar module propulsion systems and rendezvous and landing radar devices during completion of the first rendezvous and re-docking maneuvers in lunar orbit. In addition to demonstrating that man could navigate safely and accurately in the Moon's gravitational fields, Apollo 10 photographed and mapped tentative landing sites for future missions.

In his three space flights, Stafford has completed five rendezvous and logged 290 hours and 15 minutes in space.

As Chief of the Astronaut Office from August 1969 through May 1971, he was responsible for the coordination, scheduling, and control of all activities involving NASA astronauts. Gen. Stafford was named Deputy Director of Flight Crew Operations in June 1971. In this management capacity, he assists in directing the activities of the Astronaut Office, the Aircraft Operations Office, the Flight Crew Integration Division, the Crew Training and Simulation Division, and the Crew Procedures Division.

Gen. Stafford will command the United States flight crew for the Apollo/Soyuz Test Project (ASTP) mission.

NAME: Vance DeVoe Brand (Mr.)
NASA Astronaut

BIRTHPLACE AND DATE: Born in Longmont, Colorado, May 9, 1931.
His parents, Dr. and Mrs. Rudolph W. Brand, reside in Longmont.

PHYSICAL DESCRIPTION: Blond hair; gray eyes; height: 5 feet 11 inches; weight: 175 pounds.

EDUCATION: Graduated from Longmont High School, Longmont, Colorado; received a Bachelor of Science degree in Business from the University of Colorado in 1953, a Bachelor of Science degree in Aeronautical Engineering from the University of Colorado in 1969, and a Master's degree in Business Administration from the University of California at Los Angeles in 1964.

MARITAL STATUS: Married to the former Joan Virginia Weninger of Chicago, Illinois. Her parents, Mr. and Mrs. Ralph D. Weninger, reside in Chicago.

CHILDREN: Susan N., April 30, 1954; Stephanie, August 6, 1955; Patrick R., March 22, 1958; Kevin S., December 1, 1963.

RECREATIONAL INTERESTS: Enjoys running to stay in condition, skin diving, skiing, and canoeing.

ORGANIZATIONS: Member of the Society of Experimental Test Pilots, the American Institute of Aeronautics and Astronautics, Sigma Nu, and Beta Gamma Sigma.

SPECIAL HONORS: JSC Certificate of Commendation (1970) and NASA Exceptional Service Medal (1974).

EXPERIENCE: Military. Brand served as a commissioned officer and naval aviator with the U.S. Marine Corps from 1953 to 1957. His Marine Corps assignments included a 15-month tour in Japan as a jet fighter pilot. Following release from active duty, he continued in Marine Corps Reserve and Air National Guard fighter squadrons until 1964; and he still retains a commission in the Air Force Reserve.

Civilian. From 1960 to 1966, Brand was employed as a civilian by the Lockheed Aircraft Corporation. He worked first as a flight test engineer on the P3A "Orion" aircraft and later transferred to the experimental test pilot ranks. In 1963, he graduated from the U.S. Naval Test Pilot School and was assigned to Palmdale, California, as an experimental test pilot on Canadian

BRAND:2

and German F-104 development programs. Immediately prior to his selection to the astronaut program, Brand was assigned to the West German F-104G Flight Test Center at Istres, France, as an experimental test pilot and leader of a Lockheed flight test advisory group.

He has logged more than 4,500 hours of flying time, which include more than 3,670 hours in jets and 390 hours in helicopters.

CURRENT ASSIGNMENT: Mr. Brand is one of the 19 astronauts selected by NASA in April 1966. He served as a crew member for the thermal vacuum testing of the prototype command module and was an astronaut support crewman for the Apollo 8 and 13 missions. He was the backup command module pilot for Apollo 15.

Brand served as backup commander for the Skylab 3 and Skylab 4 missions.

Immediately following fulfillment of his Skylab assignments, he commenced training as a prime crewman for the Apollo-Soyuz Test Project (ASTP) mission.

-more-

NAME: Donald K. Slayton (Mr.)
Director, Flight Crew Operations

BIRTHPLACE AND DATE: Born March 1, 1924, in Sparta, Wisconsin.

PHYSICAL DESCRIPTION: Brown hair; blue eyes; height: 5 feet
10½ inches; weight: 165 pounds.

EDUCATION: Graduated from Sparta High School; received a Bachelor of Science degree in Aeronautical Engineering from the University of Minnesota, Minneapolis, 1949; an Honorary Doctorate in Science from Carthage College, Carthage, Illinois, in 1961; and an Honorary Doctorate in Engineering from Michigan Technological University, Houghton, Michigan, in 1965.

MARITAL STATUS: Married to the former Marjory Lunney of Los Angeles, California. Her parents, Mr. and Mrs. George Lunney, reside in Los Angeles.

CHILDREN: Kent, April 8, 1957.

RECREATIONAL INTERESTS: His hobbies are hunting, fishing, and shooting.

ORGANIZATIONS: Associate fellow of the Society of Experimental Test Pilots (ASETP); fellow of the American Astronautical Society; member of the American Institute of Aeronautics and Astronautics, the Experimental Aircraft Association, the Space Pioneers, and the Confederate Air Force; life member of the Order of Daedalians and the National Rifle Association of America; and honorary member of the American Fighter Aces Association.

SPECIAL HONORS: Awarded two NASA Distinguished Service Medals and the NASA Exceptional Service Medal; the Collier Trophy; the SETP Iven C. Kinchloe Award; the General Billy Mitchell Award; and the SETP J. H. Doolittle Award for 1972.

EXPERIENCE: Slayton entered the Air Force as an aviation cadet and received his wings in April 1943 after completing flight training at Vernon and Waco, Texas.

As a B-25 pilot with the 340th Bombardment Group, he flew 56 combat missions in Europe. He returned to the United States in mid-1944 as a B-25 instructor pilot at Columbia, South Carolina, and later served with a unit responsible for checking pilot proficiency in the

-Slayton:2

B-26. In April 1945, he was sent to Okinawa with the 319th Bombardment Group and flew seven combat missions over Japan. He served as a B-25 instructor for one year following the end of the war and subsequently left the Air Force to enter the University of Minnesota.

He became an aeronautical engineer after graduation and worked for two years with the Boeing Aircraft Corporation at Seattle, Washington, before being recalled to active duty in 1951 with the Minnesota Air National Guard.

Upon reporting for duty, he was assigned as maintenance flight test officer of an F-51 squadron located in Minneapolis, followed by 18 months as a technical inspector at Headquarters Twelfth Air Force, and a similar tour as fighter pilot and maintenance officer with the 36th Fighter Day Wing at Bitburg, Germany.

Returning to the United States in June 1955, he attended the USAF Test Pilot School at Edwards Air Force Base, California. He was a test pilot there from January 1956 until April 1959 and participated in the testing of fighter aircraft built for the United States Air Force and some foreign countries.

He has logged more than 5,000 hours flying time, including 3,000 hours in jet aircraft.

CURRENT ASSIGNMENT: Mr. Slayton was named as one of the Mercury astronauts in April 1959. He was originally scheduled to pilot the Mercury-Atlas 7 mission but was relieved of this assignment due to a heart condition which was discovered in August 1959. The MA-7 mission was subsequently flown by M. Scott Carpenter in May 1962.

Slayton became Coordinator of Astronaut Activities in September 1962 and was responsible for the operation of the Astronaut Office. In November 1963, he resigned his commission as an Air Force Major to assume the role of Director of Flight Crew Operations. In this capacity, he is responsible for directing the activities of the Astronaut Office, the Aircraft Operations Office, the Flight Crew Integration Division, the Crew Training and Simulation Division, and the Crew Procedures Division.

In March 1972, following a comprehensive review of his medical status by NASA's Director for Life Sciences and the Federal Aviation Agency, Mr. Slayton was restored

Slayton:3

to full flight status and certified eligible for future manned space flights.

Slayton was named to the United States flight crew for the Apollo Soyuz Test Project (ASTP) mission. He will be making his first journey into space.

-more-

NAME: Alan L. Bean (Captain, USN)
NASA Astronaut

BIRTHPLACE AND DATE: Born in Wheeler, Texas, on March 15, 1932. His parents, Mr. and Mrs. Arnold H. Bean, reside in his hometown Fort Worth, Texas.

PHYSICAL DESCRIPTION: Brown hair; hazel eyes; height: 5 feet 9½ inches; weight: 155 pounds.

EDUCATION: Graduated from Paschal High School in Fort Worth, Texas; received a Bachelor of Science degree in Aeronautical Engineering from the University of Texas in 1955; awarded an Honorary Doctorate of Science from Texas Wesleyan College in 1972.

MARITAL STATUS: Married to the former Sue Ragsdale of Dallas, Texas; her parents, Mr. and Mrs. Edward B. Ragsdale, are residents of that city.

CHILDREN: Clay A., December 18, 1955; Amy Sue, January 21, 1963.

RECREATIONAL INTERESTS: He enjoys being with his two children, and his hobbies include reading, painting, swimming, and diving.

ORGANIZATIONS: Fellow of the American Astronautical Society; member of the Society of Experimental Test Pilots.

SPECIAL HONORS: Awarded two NASA Distinguished Service Medals, the Navy Astronaut Wings and two Navy Distinguished Service Medals, recipient of the Rear Admiral William S. Parsons Award for Scientific and Technical Progress, the University of Texas Distinguished Alumnus Award and Distinguished Engineering Graduate Award, the Godfrey L. Cabot Award, the National Academy of Television Arts and Sciences Trustees Award, the Texas Press Association's Man of the Year Award for 1969, and the City of Chicago Gold Medal.

EXPERIENCE: Bean, a Navy ROTC student at Texas, was commissioned upon graduation in 1955. Upon completing his flight training, he was assigned to jet Attack Squadron 44 in Jacksonville, Florida. After a four-year tour of duty, he attended the Navy Test Pilot School at the Naval Air Test Center, Patuxent River, Maryland. After graduation he flew as a test pilot all types of naval aircraft (jet, propeller, and helicopter models). He then attended the School of Aviation Safety at the University of Southern California and was next assigned to Attack Squadron 172 at Cecil Field, Florida.

Bean:2

During his career, Captain Bean has flown 27 types of military aircraft as well as many civilian airplanes. He has logged more than 4,744 hours flying time -- including 3,923 hours in jet aircraft.

CURRENT ASSIGNMENT: Captain Bean was one of the third group of astronauts named by NASA in October 1963. He served as backup command pilot for the Gemini 10 mission and as backup lunar module pilot for the Apollo 9 mission.

Captain Bean was lunar module pilot on Apollo 12, man's second lunar landing, November 14-24, 1969. Captain Bean and Captain Conrad brought their lunar module to a safe touchdown in the Moon's Ocean of Storms -- after a flight of some 250,000 miles to within 300 feet of their targeted landing point. They explored the lunar surface for a distance of about 1 mile and deployed several lunar surface experiments, installing the first nuclear power generator station on the Moon to provide the power source. These long-term scientific experiments continue in operation today. Conrad and Bean then inspected Surveyor III, which had landed on the Moon some 30 months earlier, returning several parts to Earth. Throughout the lunar surface stay by Conrad and Bean, Captain Richard Gordon remained in lunar orbit aboard the command module, photographing landing sites for future missions and other areas of scientific interest.

Captain Bean was spacecraft commander of a Skylab mission (SL-3), July 28 to September 25, 1973. With him in the 59-day, 24,400,000-mile world record setting flight, were scientist-astronaut Dr. Owen K. Garriott and Marine Corps Lt. Colonel Jack R. Lousma. Mission II accomplished 150% of its pre-mission forecast goals. The crew returned to Earth 77,600 frames of film from 6 instruments recording the sun's activities. They also acquired 16,000 photographs and 18 miles of magnetic tape documenting our Earth's resources. The crew completed 333 medical experiment runs, obtaining the first data on the effects of weightlessness for 59 days.

Captain Bean has logged 1,671 hours and 45 minutes in space -- of which 10 hours and 26 minutes were spent in EVAs on the Moon and in Earth orbit.

Captain Bean is now in training as backup spacecraft commander of the United States flight crew for the joint American-Russian Apollo Soyuz Test Project.

NAME: Ronald E. Evans (Captain, USN)
NASA Astronaut

BIRTHPLACE AND DATE: Born November 10, 1933, in St. Francis, Kansas. His father, Mr. Clarence E. Evans, lives in Bird City, Kansas, and his mother, Mrs. Marie A. Evans, resides in Topeka, Kansas.

PHYSICAL DESCRIPTION: Brown hair; brown eyes; height: 5 feet 11 inches; weight: 160 pounds.

EDUCATION: Graduated from Highland Park High School in Topeka, Kansas; received a Bachelor of Science degree in Electrical Engineering from the University of Kansas in 1956 and a Master of Science degree in Aeronautical Engineering from the U.S. Naval Postgraduate School in 1964.

MARITAL STATUS: Married to the former Jan Pollom of Topeka, Kansas; her parents, Mr. and Mrs. Harry M. Pollom, reside in Sun City, Arizona.

CHILDREN: Jaime D. (daughter), August 21, 1959; Jon P. (son), October 9, 1961.

RECREATIONAL INTERESTS: Hobbies include hunting, boating, swimming, fishing, and golfing.

ORGANIZATIONS: Member of Tau Beta Pi, Society of Sigma Xi, and Sigma Nu.

SPECIAL HONORS: Presented the NASA Distinguished Service Medal (1973), the Johnson Space Center Superior Achievement Award (1970); the Navy Distinguished Service Medal (1973), Navy Astronaut Wings, eight Air Medals, the Viet Nam Service Medal, and the Navy Commendation Medal with combat distinguishing device (1966); the University of Kansas Distinguished Service Citation (1973); Kansan of the Year (1972); and the Republic of Senegal's National Order of the Lion (1973).

EXPERIENCE: When notified of his selection to the astronaut program, Evans was on sea duty in the Pacific -- assigned to VF-51 and flying F8 aircraft from the carrier USS Ticonderoga during a period of seven months in Viet Nam combat operations.

Evans:2

He was a Combat Flight Instructor (F8 aircraft) with VF-124 from January 1961 to June 1962 and, prior to this assignment, participated in two WESTPAC aircraft carrier cruises while a pilot with VF-142. In June 1957, he completed flight training after receiving his commission as an Ensign through the Navy ROTC Program at the University of Kansas.

Total flight time accrued during his military career is 4,400 hours -- 4,000 hours in jet aircraft.

CURRENT ASSIGNMENT: Captain Evans is one of the 19 astronauts selected by NASA in April 1966. He served as a member of the astronaut support crews for the Apollo 7 and 11 flights and as backup command module pilot for Apollo 14.

On his first journey into space, Captain Evans occupied the command module pilot seat for Apollo 17 which commenced at 11:33 p.m. (CST), December 6, 1972, and concluded on December 19, 1972 -- the last scheduled manned mission to the Moon for the United States. He was accompanied on this voyage of the command module "America" and the lunar module "Challenger" by Eugene Cernan (spacecraft commander) and Harrison H. (Jack) Schmitt (lunar module pilot). While Cernan and Schmitt completed their explorations of the Taurus-Littrow landing area down on the lunar surface, Evans maintained a solo vigil in lunar orbit aboard the "America," completing assigned work tasks which required visual geological observations, hand held photography of specific targets, and the control of cameras and other highly sophisticated scientific equipment carried in the command module SIM-bay. Evans later completed a 1-hour and 6-minute extravehicular activity during the transearth coast phase of the return flight, successfully retrieving three camera cassettes and completing a personal inspection of the equipment bay area. This last mission to the moon for the United States broke several records set by previous flights which include: longest manned lunar landing flight (301 hours, 51 minutes); longest lunar surface extravehicular activities (22 hours and 4 minutes); largest lunar sample return (an estimated 115 kg (249 lbs)); and longest time in lunar orbit (147 hours, 48 minutes). Apollo 17 ended with a splashdown in the Pacific Ocean approximately 0.4 mile from the target point and 4.3 miles from the prime recovery ship, the USS Ticonderoga.

Evans:3

Completing his first space flight, Captain Evans has logged 301 hours and 51 minutes in space -- 1 hour and 6 minutes of which were spent in extravehicular activity.

Evans is backup command module pilot for the Apollo Soyuz Test Project (ASTP) mission.

-more-

NAME: Jack Robert Lousma (Lieutenant Colonel, USMC)
NASA Astronaut

BIRTHPLACE AND DATE: Born February 29, 1936, in Grand Rapids, Michigan. His father, Mr. Jacob Lousma, resides in Jackson, Michigan.

PHYSICAL DESCRIPTION: Blond hair; blue eyes; height: 6 feet; weight: 195 pounds.

EDUCATION: Attended Tappan Junior High School and Ann Arbor High School in Ann Arbor, Michigan; received a Bachelor of Science degree in Aeronautical Engineering from the University of Michigan in 1959 and the degree of Aeronautical Engineer from the U.S. Naval Postgraduate School in 1965; presented an Honorary Doctorate of Astronautical Science from the University of Michigan in 1973.

MARITAL STATUS: Married to the former Gratia Kay Smeltzer of Ann Arbor, Michigan. Her mother, Mrs. Chester Smeltzer, resides in Bear Lake, Michigan.

CHILDREN: Timothy J., December 22, 1963; Matthew O., July 14, 1966; Mary T., September 22, 1968.

RECREATIONAL INTERESTS: He is an avid golfing enthusiast and enjoys hunting and fishing.

ORGANIZATIONS: Member of the Society of the Sigma Xi, the University of Michigan "M" Club, and the Officers' Christian Fellowship.

SPECIAL HONORS: Awarded the Johnson Space Center Certificate of Commendation (1970) and the NASA Distinguished Service Medal (1973); presented the Navy Distinguished Service Medal and the Navy Astronaut Wings (1974), the City of Chicago Gold Medal (1974).

EXPERIENCE: Lousma was assigned as a reconnaissance pilot with VMCJ-2, 2nd MAW, at Cherry Point, North Carolina, before coming to Houston and the Lyndon B. Johnson Space Center.

He has been a Marine Corps Officer since 1959 and received his wings in 1960 after completing his training at the U.S. Naval Air Training Command. He was then assigned to VMA-224, 2nd MAW, as an attack pilot and later served with VMA-224, 1st MAW, at Iwakuni, Japan.

Lousma:2

He has logged 3,000 hours of flight time -- 2,800 hours in jet aircraft and 200 hours in helicopters.

CURRENT ASSIGNMENT: Lt. Colonel Lousma is one of the 19 astronauts selected by NASA in April 1966. He served as a member of the astronaut support crews for the Apollo 9, 10, and 13 missions.

Lousma was pilot for Skylab (SL-3), July 28 to September 25, 1973. With him on this 59½-day flight were Alan L. Bean (spacecraft commander) and Owen K. Garriott (science-pilot). SL-3 accomplished 150% of many mission goals while completing 858 revolutions of the Earth and traveling some 24,400,000 miles in Earth orbit. The crew installed six replacement rate gyros used for attitude control of the spacecraft and a twin pole sunshade used for thermal control, and repaired nine major experiment or operational equipment items. They devoted 305 manhours to extensive solar observations from above the Earth's atmosphere, which included viewing two major solar flares and numerous smaller flares and coronal transients. Also acquired and returned to Earth were 16,000 photographs and 18 miles of magnetic tape documenting Earth resources observations of the 67 regional planning and development sites, 34 ocean investigation sites, 59 geological sites, 22 continental water resources sites, and 17 coastal zones, shoals, and bays. The crew completed 333 medical experiment performances and obtained valuable data on the effects of extended weightlessness on man. SL-3 ended with a Pacific splashdown and recovery by the USS New Orleans.

The crew of SL-3 logged 1,427 hours and 9 minutes each, setting a new world record for a single mission, and Lousma also logged 11 hours and 2 minutes in two separate extravehicular activities outside the orbital workshop.

Lousma has been designated backup docking module pilot of the United States flight crew for the Apollo Soyuz Test Project (ASTP) mission.

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ASTP PRIME CREW-USSR



COSMONAUT SELECTION	A. LEONOV 1960	V. KUBASOV 1967	A. FILIPCHENKO 1963	N. RUKAVISHNIKOV 1967
SPACE MISSIONS FLOWN	CO-PILOT OF VOSKHOD 2 FIRST TO PERFORM EVA IN SPACE	B/U TECHNICAL SCIENTIST SOYUZ 5 FLIGHT ENGR. SOYUZ 6	PILOT SOYUZ 7	TEST ENGINEER SOYUZ 10
PRESENT POSITION	COL. IN AIR FORCE	CIVILIAN	COL. IN AIR FORCE	CIVILIAN
EDUCATION	ATTENDED ZHUKOVSKIY ENGINEERING ACADEMY	MECHANICAL ENGR.-MS MOSCOW AVIATION SCHOOL	CHUGUYEV MILITARY SCHOOL - GRADUATED AIR FORCE ACADEMY	GRADUATED MOSCOW PHYSICS & ENGINEERING INSTITUTE
DATE OF BIRTH	30 MAY 1934	7 JAN, 1935	26 FEB 1928	18 SEPT 1932

COSMONAUT BIOGRAPHIES

NAME: Alexei Arkhipovich Leonov (Colonel, Soviet Air Force)
Commander, Soviet ASTP Crew

BIRTHPLACE AND DATE: Born May 30, 1934 in the Siberian
village of Listvyanka, Kemerovo Region. His
father was a miner.

EDUCATION: Completed secondary school in the city of
Kaliningrad, Baltic Sea area, where his parents
moved after World War II. He attended art school,
but left for flight training. He graduated from the
Chuguyev Air Force School as a pilot. In 1968 he
graduated from Zhukovsky Air Force Academy.

MARITAL STATUS: His wife, Svetlana, is a graduate of a
teachers institute and now works as an editor. They
have two daughters: Victoria 13, and Oksana, seven.

HOBBIES AND RECREATIONAL INTERESTS: Sketching and painting;
has a collection of reproductions and books on
art.

ORGANIZATIONS: Central Committee of the Young Communist
League, a deputy to the Moscow Regional Soviet,
Vice-President of the USSR-ARE Friendship Society,
and a Board member of the USSR-Italy Society.

SPECIAL HONORS: Hero of the Soviet Union

EXPERIENCE: After graduating from the Chuguyev Air Force
School he qualified as a paratroop instructor and has
made more than 100 parachute jumps. He was invited
to join the first group of Soviet cosmonauts, which
included Yuri Gagarin, Gherman Titov and Andrian
Nikolayev. In one pre-flight year he covered more
than 600 miles on a racing bicycle, did 125 miles
of cross-country running, skied 175 miles and spent
hundreds of hours on the running track, trampoline,
suspended rings and centrifuge.

During preparations for the Voskhod 2 flight Leonov
took part in designing a space suit, pressure lock,
control systems and auxillary systems and equipment
the earlier ships did not carry. On March 18, 1965
he was second pilot of the Voskhod 2 orbital flight
(Commander, Paul Belyayev). During the flight,
Leonov went outside the ship for 12 minutes to deter-
mine whether people could move and work in open
space. It was the first space walk. Mission dura-
tion was 26 hours, 2 minutes.

NAME: Valeri Nikolayevich Kubasov (Civilian)
Flight Engineer, Soviet ASTP Crew

BIRTHPLACE AND DATE: Born January 7, 1935 in the small town of Vyazniki on the Klyazma River, 180 miles east of Moscow. His father was a river shipping-line mechanic and often took his son on trips down the Klyazma and Volga.

EDUCATION: Graduated from secondary school in 1952 with a silver medal. Decided to be an engineer and spent six years at the Moscow Aviation Institute where he received a diploma as an engineer-mechanic in aircraft building in 1958. In 1968 he was awarded a candidate's degree in science (Master of Science in Engineering).

MARITAL STATUS: His wife, Lyudmila, is also a graduate of the Moscow Aviation Institute and works as an engineer. They have two children: Dima, a boy, three, and a daughter, Kayta, eight.

HOBBIES AND RECREATIONAL INTERESTS: Making films.

SPECIAL HONORS: Hero of the Soviet Union; authored an original theoretical paper (for which he received a Master of Science degree), and several dozen other scientific papers including one on correcting interplanetary trajectories by radial heliocentric velocity impulses.

EXPERIENCE: After graduating from the Moscow Aviation Institute he worked in a laboratory where space equipment models were designed. He was one of a group of research engineers which joined the staff of the cosmonaut training center in 1966. As part of his training he learned to use a specially designed electric welding unit for space. In October 1969 he was flight engineer on the Soyuz 6 flight (Commander, Georgi Shonin) and successfully carried out experiments of welding metals in a vacuum and in zero G. He also took part in the Soyuz 7 and 8 flights which were launched one and two days after Soyuz 6. Soyuz 6 mission (October 11-16, 1969) duration was 118 hours, 42 minutes.

NAME: Anatoli Vasilievich Filipchenko (Colonel, Soviet Air Force) Commander, ASTP Second Crew

BIRTHPLACE AND DATE: Born February 26, 1928 in the village of Davydovka, Voronezh Region (Central Russia)

EDUCATION: He had completed seven years of school in the city of Ostrogozhsk when his father went to the front during World War II. He assisted his mother at a motor repair plant and began operating a lathe at age 15. In 1947 he entered the Chuguyev Air Force School and graduated in 1950. While serving as a pilot in the Soviet Air Force he studied at the Air Force Academy (now named after Yuri Gagarin) by correspondence and graduated in 1961.

MARITAL STATUS: He and his wife, Yelizaveta, have two children: Sasha, 17 and Igor, 13.

HOBBIES AND RECREATIONAL INTERESTS: An ardent sportsman, sharpshooter and enjoys underwater spear-gun fishing.

SPECIAL HONORS: Hero of the Soviet Union.

EXPERIENCE: In the air force he advanced from junior pilot to senior pilot instructor and later Pilot First Class. In 1963 he was selected a member of the cosmonaut team. He continued to pilot supersonic planes and attained the rank of test pilot.

Filipchenko was backup command pilot for Soyuz 4 flight, launched in January 1969. He was commander of the Soyuz 7 flight (October 12-17, 1969) with Vladislav Voikov serving as flight engineer and Victor Gorbatko as research engineer. The crew carried out scientific and technical experiments in the group flight with Soyuz 6, 7 and 8. A new feature of the three space ships was orbital maneuvers performed on ground command and by the cosmonauts over the night part of the Earth. Mission duration was 118 hours, 41 minutes.

NAME: Nikolai Nikolayevich Rukavishnikov (Civilian)
Flight Engineer, Soviet ASTP Second Crew

BIRTHPLACE AND DATE: Born September 18, 1932 in the Siberian city of Tomsk. As a child he accompanied his mother, a railroad surveyor, to the primeval forests of Siberia and became accustomed to the hardships of the camp life.

EDUCATION: Completed secondary school in 1951 and graduated with honors from the Moscow Institute of Engineering and Physics in 1957.

MARITAL STATUS: His wife, Nina, is a senior technician at a machine-building plant. They have a nine year old son, Vladimir.

SPECIAL HONORS: Hero of the Soviet Union. His diploma work at the Moscow Institute of Engineering and Physics was published in a scientific journal.

EXPERIENCE: As an engineer he helped develop automatic control systems, but did not consider the work challenging enough and wanted to test the instruments and systems he designed in space. He was approved for space flight as a cosmonaut in 1967 after tests on a centrifuge, rotar and vibrobench; flights with an instructor on jet planes; parachute jumping and weightlessness training in a "flying laboratory".

He became a leading specialist in experiments related to Earth and solar physics and was chosen for the Soyuz 10 crew as test engineer with commander Vladimir Shatalov and flight engineer Alexei Yeliseyev. During the 47 hour, 46 minute flight, April 22-24, 1971, Rukavishnikov handled all experiments in the program.

NAME: Vladimir Alexandrovich Dzhaniybekov (or Janibekov)
(Major, Soviet Air Force)
Commander, Third Soviet ASTP Crew

BIRTHPLACE AND DATE: Born in 1942 in the village of Iskander, Kazakhstan. His father was a fireman and his mother a nurse. After World War II the family moved to Tashkent, capital of Uzbekistan.

EDUCATION: After attending secondary school in Tashkent, he spent one year in the physics department of Leningrad University. Entered a higher military aviation school in August 1961 where he was an excellent student and graduated in 1965.

MARITAL STATUS: His wife, Lilia, graduated from a music conservatory and is a school singing teacher. They have two children: Olya, born in May 1974 and Inna, five.

HOBBIES AND RECREATIONAL INTERESTS: Ham radio operator; built his own hi-fi system; reads extensively on radio engineering and Shakespeare's sonnets in English, many of which he recites from memory. Is a good painter and his cartoons are a permanent feature on the cosmonauts' walls.

EXPERIENCE: He spent five years as a flight instructor after graduation from the aviation school. While training a group of flyers from India, he improved his English and spent evenings reading English textbooks and dictionaries. He joined the cosmonaut team in 1970.

NAME: Boris Dmitrievich Andreyev (Civilian)
Flight Engineer, Third Soviet ASTP Crew

BIRTHPLACE AND DATE: Born in 1940 in Moscow. His father was seriously wounded at Stalingrad during World War II and remained an invalid. His mother is an economist.

EDUCATION: After completing secondary school he entered the Bauman Higher Technical School, an institution which has produced many scientists and engineers including Korolyov, the spaceship designer, and cosmonauts Feoktistov, Yeliseyev and Makarov. He specialized in automatic control systems, was a member of the student scientific society and participated in track and field sports.

MARITAL STATUS: His wife is also an engineer and graduated from Bauman. They have two children: Dmitri, five and Tatyana, three.

HOBBIES AND RECREATIONAL INTERESTS: Tinkering with his car, cycling and skiing.

EXPERIENCE: After graduation from school he worked at a design office developing and testing elements of automatic control systems. He also took a special course in English. In 1970 he joined the Cosmonaut team.

NAME: Yuri vitorovich Romanenko (Major, Soviet Air Force)
Commander, Fourth Soviet ASTP Crew

BIRTHPLACE AND DATE: Born August 1, 1944 at Koltubanka,
Buzuluk District, Orenburg Region. His father is
a ship captain and his childhood was spent on the
shores of the northern Russian seas.

EDUCATION: He entered an Air Force School in 1962 where he
was one of the top graduates. Alexander Malinovsky,
a Russian World War II pilot and hero, influenced
his desire to seek a career in aviation.

MARITAL STATUS: His wife, Alevtina, is a singing teacher
in secondary school. They have a three year old son.

HOBBIES AND RECREATIONAL INTERESTS: Making powered flight
model aircraft and underwater spearfishing.

EXPERIENCE: Was a flight instructor after graduation when
he logged 700 hours in the air and became an ace
pilot. A visit by Gherman Titov, the second cosmo-
naut to fly in Earth orbit, to his regiment convinced
Romanenko that space would be the next step in his
career. He became a member of the cosmonaut team
in 1970.

NAME: Alexander Sergeyevich Ivanchenkov (Civilian)
Flight Engineer, Fourth Soviet ASTP Crew

BIRTHPLACE AND DATE: Born in 1940 in Ivanteyevka, a small town near Moscow. Both of his parents were design engineers. His father was killed in battle near Rzhev in 1942, and his mother died five years later. He was reared by a grandmother and an aunt.

EDUCATION: Completed secondary school and graduated from Moscow Aviation Institute where he was a member of the student scientific society and also designed systems for sports planes and gliders.

MARITAL STATUS: His wife, Rimma, is a medical internist. She has completed a graduate course at the First Medical Institute and will be defending her candidate's thesis. Their child, Tanya, is six.

HOBBIES AND RECREATIONAL INTERESTS: Mountain skiing.

EXPERIENCE: After graduation from the Institute he worked in a design office and moved ahead rapidly in his work on engineering computations, computers and computer programming. He became a cosmonaut in 1970.